FROST FREE CHEST FREEZER With ERF1050 electronic

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1. INTRODUCTION

Consumer segmentation research reveals particular consumer problems relating to the use of chest freezers. The task of defrosting is seen as one of the key problems.

Solution: chest freezer with automatically defrosting (FROST-FREE).

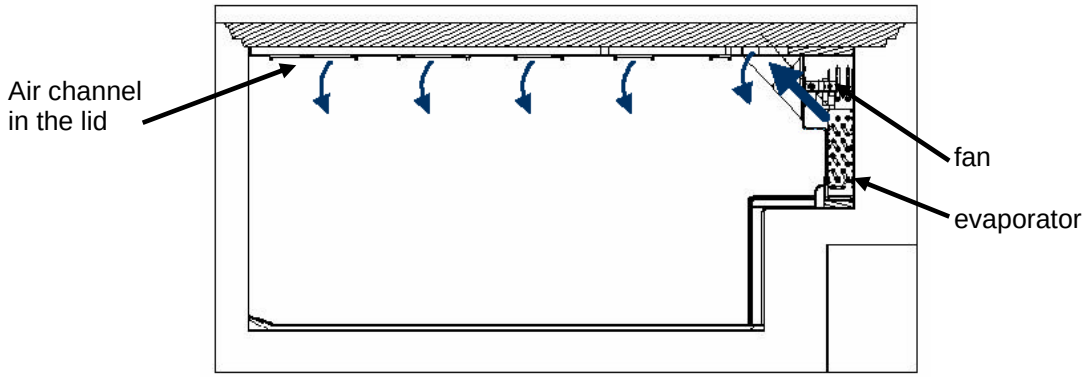
The biggest technical problem: How is possible to ensure the equal flow of cold air (equal temperature) in all part of the freezer area?)

This manual describes the Word No.1 FROST-FREE CHEST FREEZER models WITH ELECTRONIC TIMER (**ERF1050)**.

2. WORKING IDEA

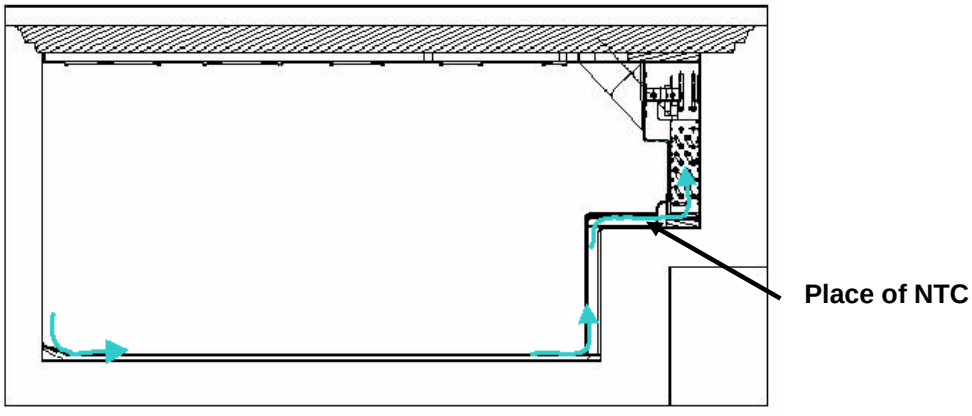
AIR DISRITBUTION

A fan near battery type evaporator moves the air in the freezer area. The cold air gets to the air channels of the lid, and distributes via its holes to all storing area.



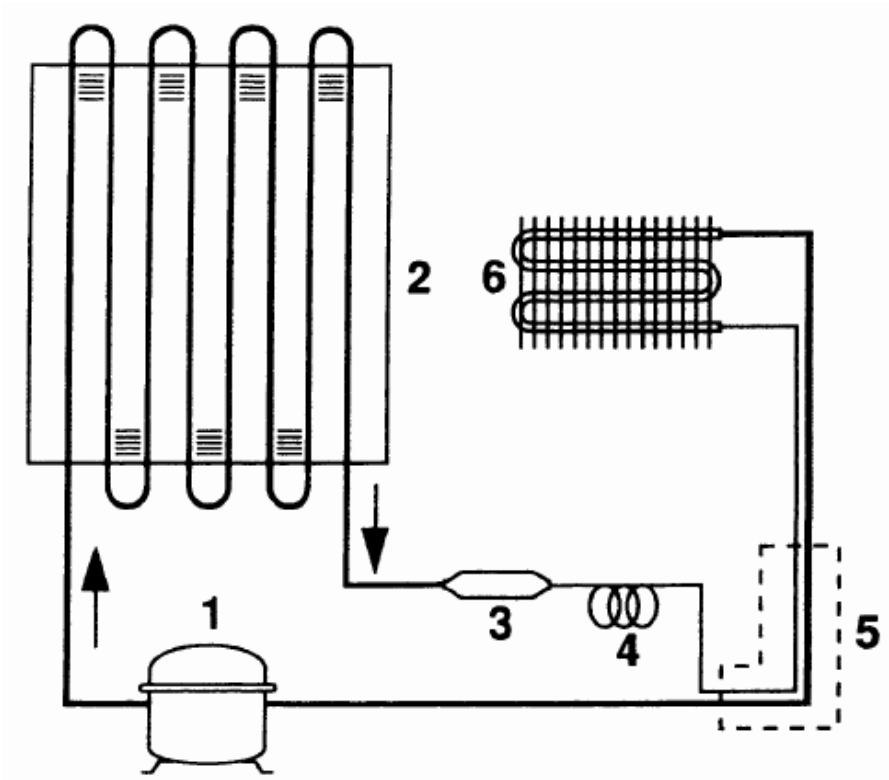
SUCTION

The return airflow is through a vent in the cabinet's false floor, left-hand side, and up to the base of the evaporator again. The temperature-measuring sensor (NTC) is on the way of sucked air.



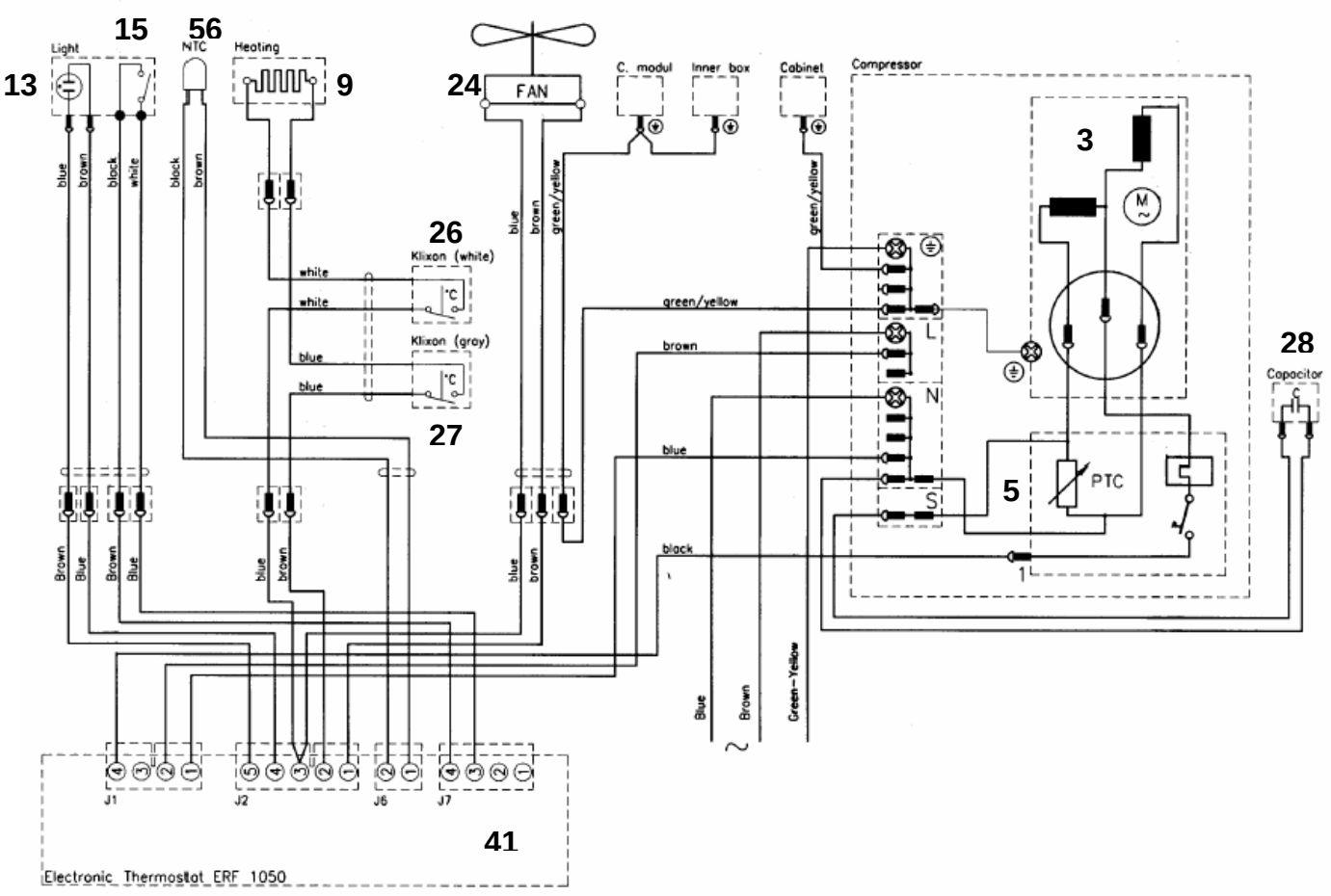
The condenser is the conventional skin type mounted around the inside of the casing.

3. REFRIGERATION CIRCUIT



Key:
1. compressor
2. condenser
3. filter
4. capillary
5. heat exchanger
6. battery evaporator

4. ELECTRIC WIRING



Key:
3. compressor
5. motor protector
9. defrosting heater
13. lamp
15. light switch
24. battery fan
26. safety thermal switch (+40°C)
27. defrosting cut-out switch (+10°C)
28. running capacitor (only for the models which feature it)
41. electronic thermostat assembly with timer
56. NTC sensor

5. OPERATION

5.1 NORMAL

When the thermostat knob is on (OFF) position it means that:
- the compressor is off;
- all Leds are off;
- the electronic board is powered (220-240V 50Hz ! ! !).

Warning: the electronic board is powered with a 220-240V 50Hz voltage even if the thermostat knob is on (OFF) position. Therefore, disconnect the appliance from the electric power before operating with the electronic board.

By rotating clockwise the thermostat knob the green LED switches ON.

In FROST-FREE chest freezer, the humidity inside the freezer compartments accumulates on the evaporator battery, thanks to the air circulation, thus preventing the formation of frost on food.
During normal operation time the electronic board powers the compressor and the fan circuits.
The operation time which corresponds to the interval between the following defrosting lasts about 14 hours with normal opening of the door (it can last up to 71 hours if the door is never opened !).

5.2 NORMAL OPERATION WITH FIRST SWITCHING ON OR POWER FAILURE

In case of fault when the appliance is switched on for the first time or in case of a power failure, one of the two conditions described below occurs:

1. If the internal temperature is higher or the same as the cut-in temperature of the thermostat (CUT-IN), when the power is restored, the electronic board activates the compressor and the fan till the set temperature is reached and after 5 hours the electronic board activates the defrosting procedure.

2. If the internal temperature is lower than the cut-in temperature of the thermostat (CUT-IN), when the power is restored, the compressor functions in thermostatic conditions and after 5 hours the electronic board starts the defrosting procedure.

The electronic board activates, anyway, **the defrosting procedure after 5 hours in case of both the first switching on and a power failure**.

Warning: if you turn the thermostat knob anti-clockwise till the zero position (OFF), all the counters will be reset (apart from those necessary to the manual defrosting procedure) and once the thermostat knob has been turned clockwise in ON position, the compressor will operate in thermostatic conditions.

5.3 DEFROSTING

All the humidity in the compartment accumulates on the evaporator, which is the coldest part of the compartment; periodically. Every about 14 hours minimum with normal door openings (till 71 hours if the door is never opened!), it is necessary to defrost the ice which forms on the battery. Therefore the electronic board disconnects the circuit that powers the compressor and the fan and, after checking for the defrosting heater, it powers the defrosting heater for about 20 minutes minimum. **In case the defrosting heater is interrupted or its connector is disconnected, green and yellow LEDs flashing alternately and the defrosting heater lasts 1 hour.**

The heat generated by the defrosting heater does not affect the temperature of the freezer compartment or the temperature of the food packages, since the whole thermal energy is consumed in the defrosting process of the ice on the evaporator.

After 20 minutes, the board detects every minute the signal of the defrosting process in order to determine the intervention of the defrosting cut-out switch.
When the defrosting cut-out switch intervenes, the electronic control switches on the compressor and the fan again with a 5 minute delay.

If for any reason, the defrosting cut-out switch does not intervene and the temperature of the battery rises up to +40 °C, the defrosting heater will be switched off by the safety thermal switch.

Moreover, if 1 hour after the defrosting start the safety thermal switches did not switch off, the electronic board switches off anyway the defrosting heater and the process carries on.
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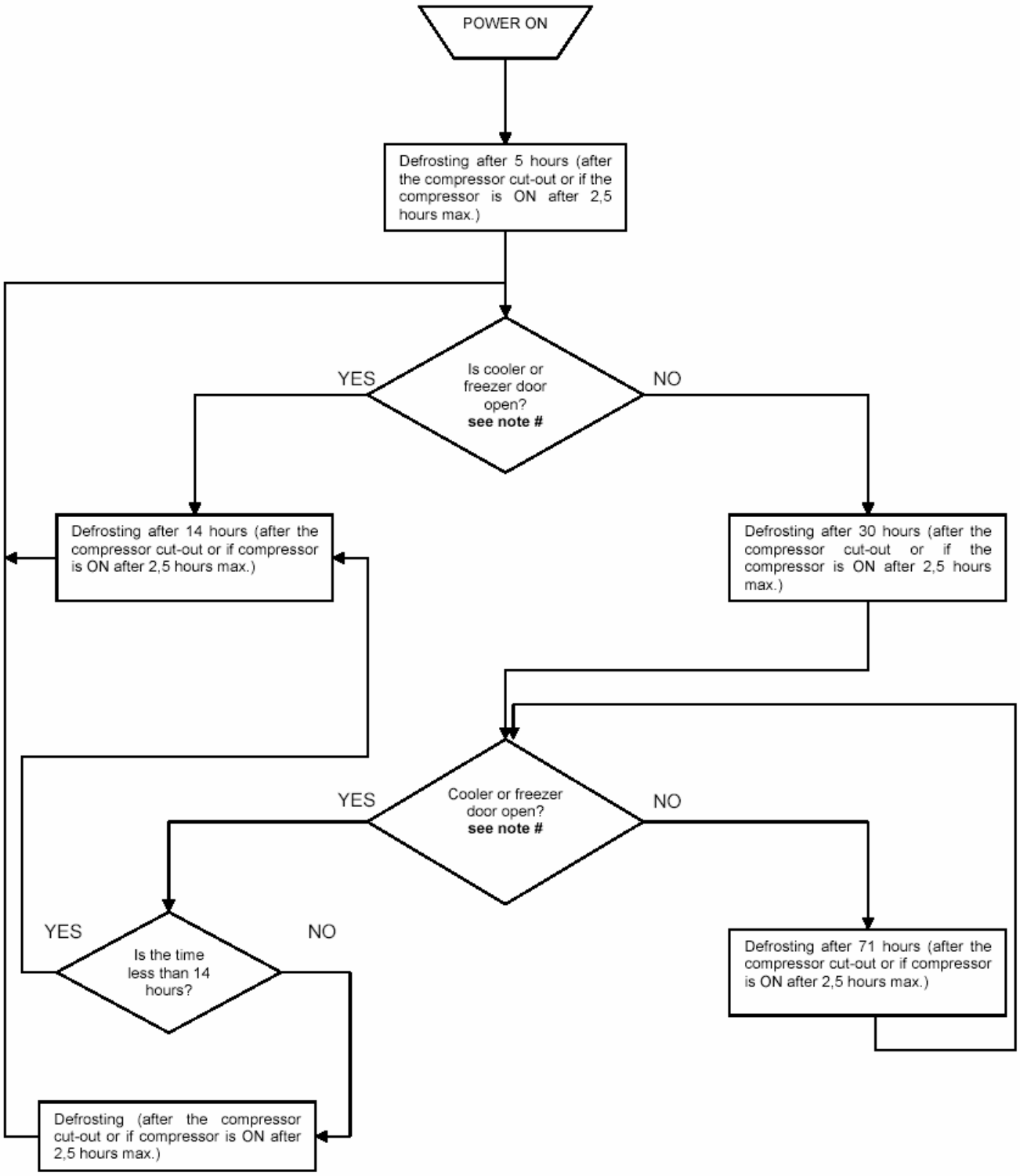
d. Flow chart for the defrosting management


POWER ON
Defrosting after 5 hours (after the compressor cut-out or if the compressor is ON after 2,5 hours max.)
Is cooler or freezer door open? see note #
YES
NO
Defrosting after 14 hours (after the compressor cut-out or if compressor is ON after 2,5 hours max.)
Defrosting after 30 hours (after the compressor cut-out or if the compressor is ON after 2,5 hours max.)
Cooler or freezer door open? see note #
YES
NO
Is the time less than 14 hours?
YES
NO
Defrosting after 71 hours (after the compressor cut-out or if compressor is ON after 2,5 hours max.)
Defrosting (after the compressor cut-out or if compressor is ON after 2,5 hours max.)

5.4 SUPER FREEZING

Pushing the SUPER button therefore activates the SUPER function:

- The yellow LED corresponding to the SUPER function is on;
- The compressor functions in thermostatic conditions and not continuously (as the thermostat knob were in max. position) for a duration of about 52 hours, and then it deactivates automatically.
- If the button is pressed again, the SUPER function is deactivated:
- The corresponding yellow LED is switched off;
- The compressor functions in thermostatic conditions.

The defrosting can occur with the SUPER function on.

5.5 NTC SENSOR MALFUNCTIONING

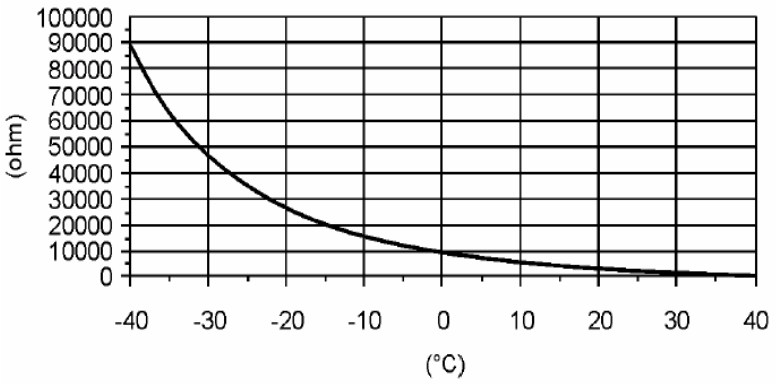
Fault alarm: Flashing red light and static green light illuminated

If during the normal functioning a NTC sensor failure occurs (the signal coming from the sensor is out of range, then:

- The appliance functions with a predefined cycle, by which the compressor is powered for 30 minutes and remains off for 45 minutes alternatively;
- The defrosting procedure starts every 14 hours.

When the sensor returns to normal operation the above mentioned functions end.

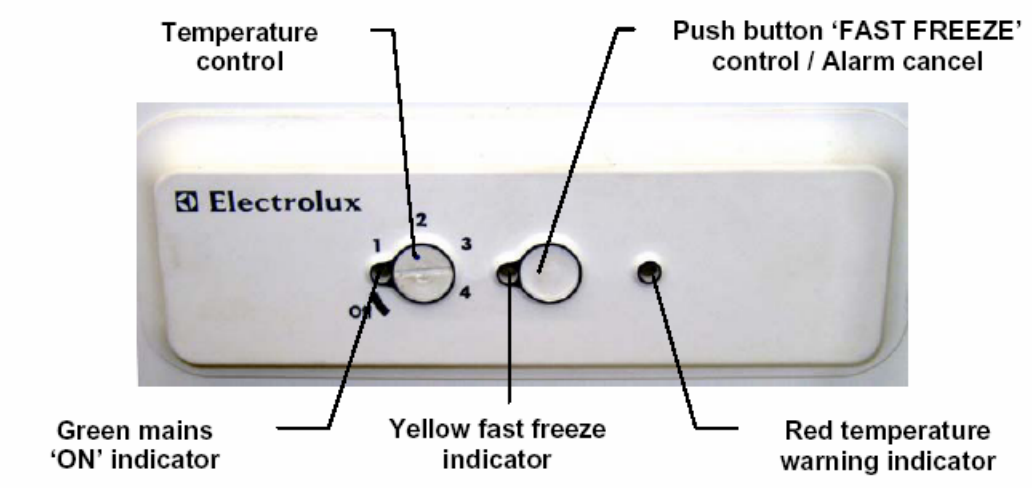
Characteristics of NTC sensor:



T(°C)	ΔT(±°C)	Rn (Ω)
10	±0.6	5337
9	±0.6	5600
8	±0.5	5877
7	±0.5	6171
6	±0.5	6481
5	±0.5	6809
4	±0.5	7156
3	±0.5	7523
2	±0.4	7911
1	±0.4	8322
0	±0.4	8758
-1	±0.4	9218
-2	±0.4	9705
-3	±0.4	10222
-4	±0.5	10770
-5	±0.5	11352
-6	±0.5	11969
-7	±0.5	12624
-8	±0.5	13320
-9	±0.5	14059
-10	±0.5	14845
-11	±0.5	15678
-12	±0.6	16564
-13	±0.6	17506
-14	±0.6	18509
-15	±0.6	19577
-16	±0.6	20715
-17	±0.6	21928
-18	±0.6	23221
-19	±0.6	24600
-20	±0.6	26072
-21	±0.7	27637
-22	±0.7	29307
-23	±0.7	31092
-24	±0.7	32999
-25	±0.7	35039
-26	±0.7	37221
-27	±0.7	39556
-28	±0.7	42056
-29	±0.8	44735
-30	±0.8	47606
-31	±0.8	50668
-32	±0.8	53952
-33	±0.8	57475
-34	±0.8	61258
-35	±0.8	65320
-36	±0.8	69686
-37	±0.8	74381
-38	±0.8	79431
-39	±0.9	84867
-40	±0.9	90721

6. COMPONENTS

6.1 CONTROL PANEL:



6.2 FREEZER COMPARTMENT:

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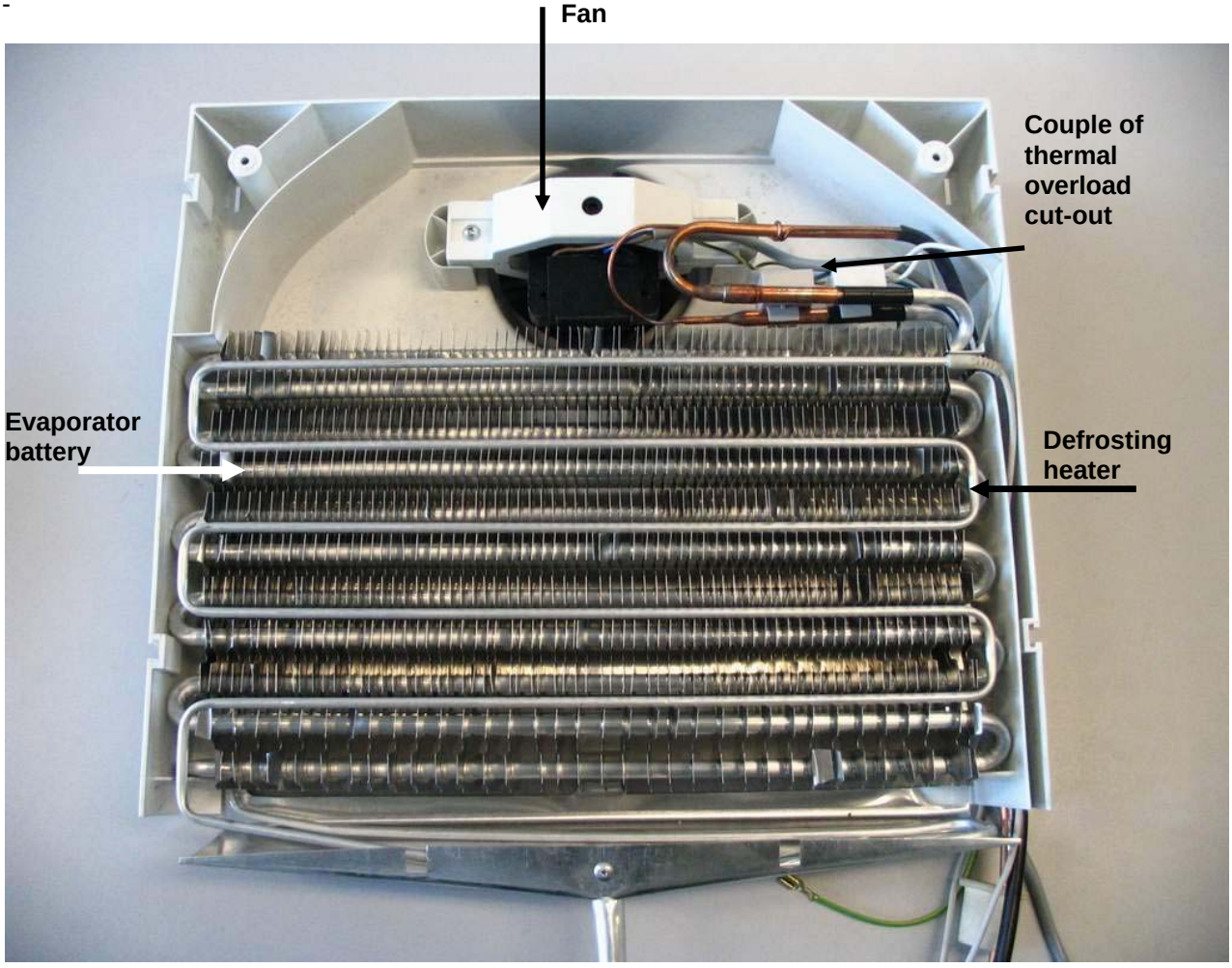

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6.3 DEFROST HEATER

-Both side of evaporator,
-Water outlet channel heating, too

P=193W	R=275 Ohm	I= cca. 0,8A

6.4 OVERLOAD CUT-OUT

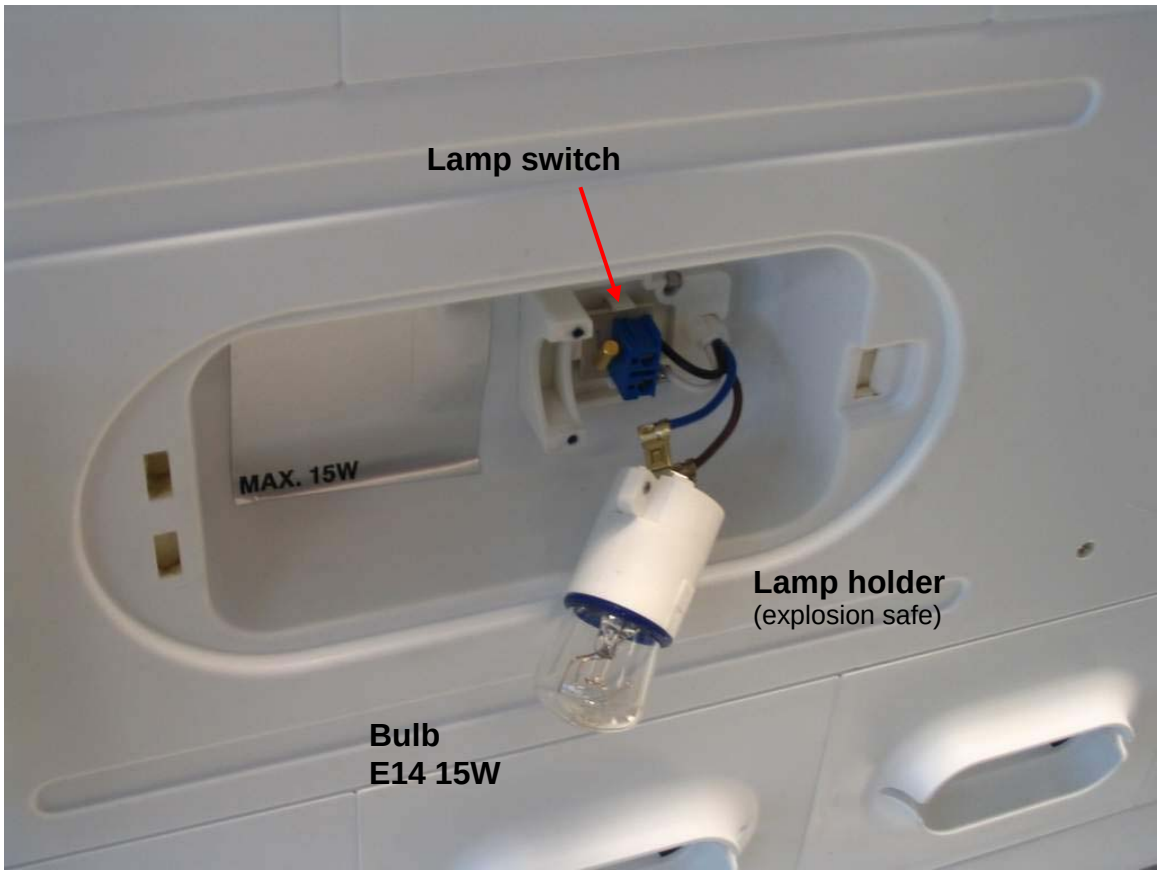
TYPE OF THERMAL OVERLOAD CUT-OUT	CUT-IN TEMPERATURE	
	OPENING	CLOSURE
DEFROSTING	+ 8 °C	- 1 °C
SAFETY	+ 40 °C	+ 30 °C

Defrosting switch off: with blue wires
Safety: with white wires
N.B: changeable only together!

6.5 LID LIGHT SWITCH

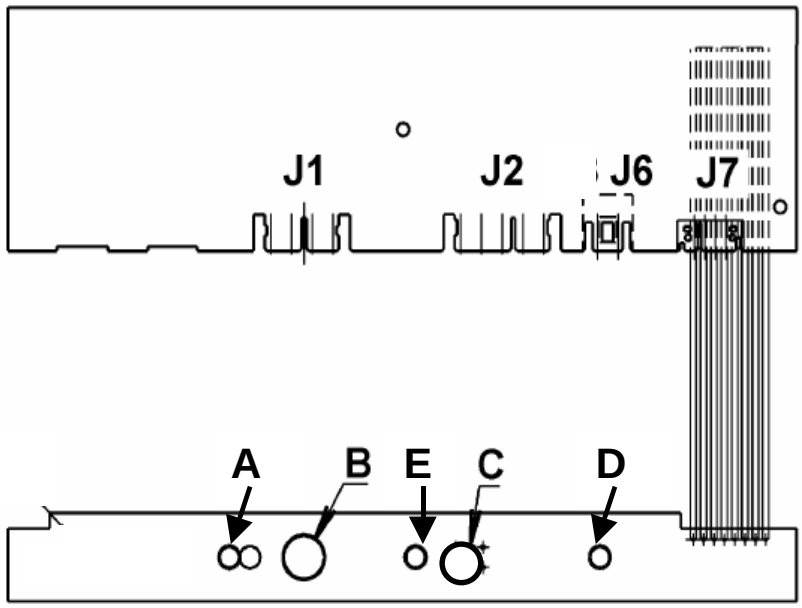
This is a separate pendulum switch mounted next to the interior light in the lid. The switch contacts close when the lid is opened to an angle greater than 45º. This activates the following functions via the electronic control board:
• Interior lamp ‘ON’
• Air circulation fan ‘OFF’
• Lid open alarm (after being open for 90 seconds)
• Lid open activity is memorised by the electronic control system to determine the defrost cycle.

NOTE: Because the evaporator is in the freezer area, and the refrigerant is R600a, the lamp holder and the switch **must be EXPLOSION SAFE version!**



6.6 ELECTRONIC BOARD (ERF1050)

VIEW OF THE ELECTRONIC BOARD (WELDING SIDE):
Optional components:
- **A** Green LED
- **B** thermostat knob;
- **C** SUPER button.
- **D** Red LED
- **E** Yellow LED



- **J1** connector board powering and compressor control;
- **J2** connector power fan components, defrosting heaters and lamp;
- **J6** connector NTC sensor;
- **J7** connector lamp switch.

J1	**J2**	**J6**	**J7**
1. neutral	1. fan	1. NTC	1. free
2. line	2. defrosting heaters	2. NTC	2. free
3. free	3. neutral		3. lamp switch
4. compressor	4. lamp		4. lamp switch
	5. lamp		

(Note: the numbering there is in the connectors!)

7. INDICATOR LIGHT MEANINGS AND FAULT CODES:

This series of frost-free chest freezer incorporates flashing and static indicator light codes to indicate a fault with a specific component or operation as follows:

• **Static red light and static green light illuminated**
– Cabinet temperature incorrect (above –8 ºC).

• **Flashing red light and static green light illuminated**
– This indicates that the sensor is open circuit or the connecting plug may be in poor contact with the control PCB. In this situation the cabinet reverts to a timed cycle of 30 minutes compressor 'run' time and 45 minutes of compressor 'off' time to protect the food within the cabinet, plus a fixed defrost cycle every 14 hours.

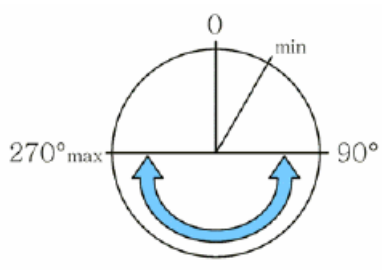
• **Green light and yellow light flashing alternately**,
– This indicates that the electronic control is unable to sense the presence of the defrost heater circuit. In other words, the heater or thermal protectors could be open circuit or the connecting plugs may be in poor contact with the control PCB. In this mode, the defrosting cycle is done on a timed basis lasting for 1 hour.

8. MANUAL DEFROSTING PROCEDURE

To execute the testing and the service, a manual defrosting procedure has been introduced that has to be carried out with cold internal temperatures (this is to avoid the possible opening of the thermal protector of the defrosting heater).

To start the manual procedure, ensure that:

- -the electronic board is powered with thermostat knob ON, position 5 (or anyway in a position between 90° and 270°);
- -the lid closed (lamp switch is OFF).



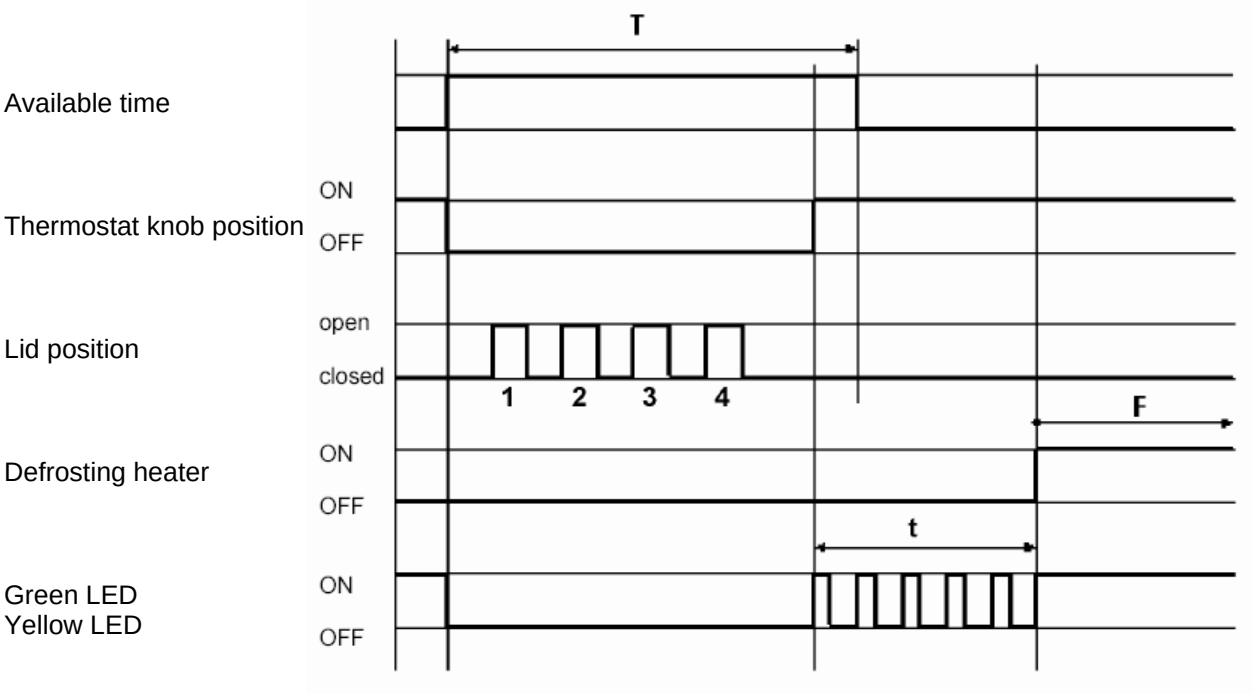
Perform the 3 following operations:
1. turn the thermostat knob to OFF position;
2. open the lid more than 45 ^{o} angle 4 times within 15 sec (let pass at least 1 second between every opening/closure);
3. turn the thermostat knob to ON, position 5 (or anyway to a position between 90° and 270°);

At this point the electronic board verifies the thermal cut-outs and all LEDs flash for 5 seconds; then if there aren't any faults, the manual defrosting phase starts. If a fault occurs, the LEDs continue to flash.

WARNING: after placing the thermostat knob in OFF position (operation 1), there are 15 seconds to perform the other 2 operations (operation 2-3) in the correct sequence.
In case of error or incorrect execution of the operations, before executing once again the manual defrosting procedure, it is necessary to reset the standard functions switching off the power to the appliance (detach the power cable).

The manual defrosting phase consists of:
. defrosting heater ON;
. green ON/OFF LED on;
. compressor and fan OFF;
In this case the electronic board performs the defrosting phase as a standard function and then continues to operate normally.

8.1 FORCED DEFROSTING TIME SHEDULE



Key:
T = 15 seconds;
t = 5 seconds (to check thermal protections);
F = standard function.

9. ACCESSABILITY (COLD MODULE)

1, Open the lid

2, Remove the FF basket (pull out from the fixing clip)

3, Take away the bottom air channel

4, Pull out the corner air channel fixing pin

5, Cut in the foil on the evaporator cover

6, Click out the fan cover with a screwdriver

7, Remove the corner air channel

8, Take away the evap. cover fixing screws

(there is the NTC sensor!)

9, Bend down the evap. cover

10, Now the defrost heating is changeable

10. ACCESSABILITY (LID)

The service lid is supplied without air inlet and outlets and ice cube maker holder. In case of lid changing they have been transferred from old to the new one.

1, Remove the closing part

2, Take away the air inlet

3, Take away the air outlets

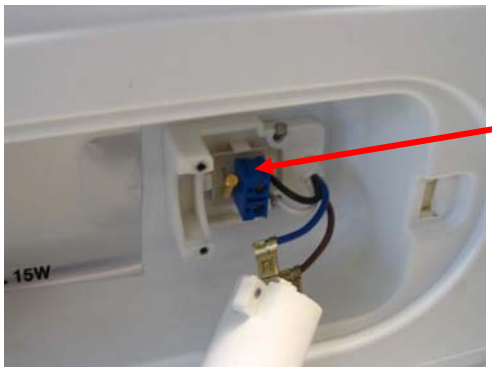
4, Remove the ice cube maker holders

Now you can put them in to the service door in opposite order.

11. ACCESSABILITY (LAMP SWITCH)

1, Remove the lamp screen

2,Screw out the lamp housing screws



Lamp switch

3, Now you can take out the lamp switch